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(54) **AN AUDIO INTERFACE ARRANGEMENT AND A HANDHELD DEVICE COMPRISING THE AUDIO INTERFACE ARRANGEMENT**

(57) The present disclosure generally relates to an audio interface arrangement. In one embodiment, a handheld device (240) comprises the audio interface arrangement (not shown). The audio interface arrangement comprises at least two audio connecting means (202), wherein each of the at least two audio connecting means (202) is adapted to connect a respective audio accessory to the audio interface arrangement. The audio interface arrangement further comprises an accessory

determining means, which is coupled to said at least two audio connecting means. The accessory determining means is adapted to determine which type of audio accessory that is connected to the respective audio connecting means (202). Hereby it is made possible to provide a handheld device (240) that offers a user with a possibility to connect several different audio accessories to the handheld device (200) at the same time.

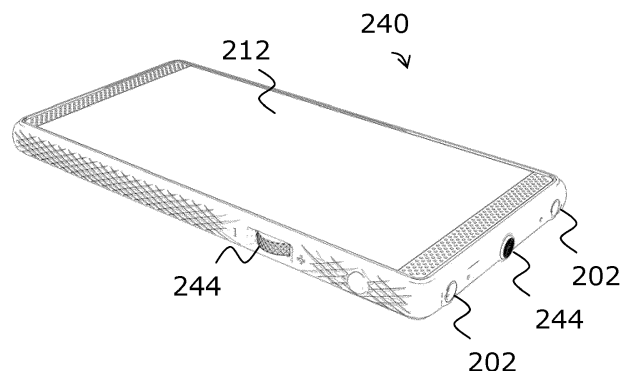


Fig. 3

Description**Technical Field**

5 **[0001]** The present disclosure generally relates to an audio interface arrangement. More particularly, the present disclosure relates to an audio interface arrangement that may be arranged in a handheld device, such as a tablet computer or a mobile phone (e.g., a smart phone). The disclosure also presents a handheld device comprising an audio interface arrangement.

Background

10 **[0002]** There is a trend towards providing handheld devices with capacity to deliver an increasing number of services to the users of the handheld devices.

15 **[0003]** Commonly, different categories of users demand various services. In order to adapt handheld devices (e.g., tablet computers, mobile phones, smart phones, personal digital assistants (PDA:s), etc.) to the users' various demands the handheld devices are provided with different applications by which the services are performed. Applications are sometimes commonly referred to as "apps".

20 **[0004]** One example of a handheld device will now be described with reference to Figure 1. The Figure 1 is a schematic illustration of a mobile phone 100, which is an example of a handheld device. The mobile phone 100 may comprise a single audio input/output socket 102, a plurality of user control devices 110, a display 112, a loudspeaker 114, and a microphone (not shown).

25 **[0005]** The socket 102 is typically arranged to enable a user to connect an external input/output accessory, such as a headset 150, to the mobile phone 100 by inserting an audio plug 152 into the socket 102. Typically, the user control devices 110 are implemented as various buttons by which users control or adjust the applications when interacting with the mobile phone 100. Traditionally, the buttons are implemented as push buttons, which the user may press with his/her fingers in order to control a functionality of the mobile phone 100. For instance the user may use a button for navigating in menus in an application, or increasing/decreasing the volume of the sound that is outputted by the loudspeaker 114 during an ongoing phone call.

30 **[0006]** As users demand more and more services and applications, it becomes a challenge to design flexible and convenient interfaces of the handheld devices.

35 **[0007]** One example of a new service offered by a mobile phone is disclosed in the Japanese patent application no. JP2007114561A, titled "Mobile Phone-Contained Voice Conversion System" and published on May 10, 2007. JP2007114561A discloses a mobile phone, which provides a Karaoke service to the user of the mobile phone.

Summary

40 **[0008]** It is in view of the above considerations and others that the various embodiments of the present invention have been made.

45 **[0009]** According to a first aspect, an audio interface arrangement for a handheld device is provided. The audio interface arrangement comprises at least two audio connecting means. Each one of the at least two audio connecting means is adapted to connect a respective audio accessory to the audio interface arrangement, e.g. at the same time. Also, the audio interface arrangement comprises an accessory determining means coupled to the at least two audio connecting means. The accessory determining means is adapted to determine which type of audio accessory that is connected to the respective audio connecting means.

50 **[0010]** Hereby it is made possible to provide an audio interface arrangement that offers a possibility to connect several different audio accessories to the audio interface arrangement. In other words, the provision of at least two audio connecting means may enable a user to connect a plurality of audio accessories to the audio interface arrangement. Furthermore, by providing an accessory determining means the audio interface arrangement is capable of determining which type of audio accessory/-ies that is/are currently connected to the audio interface arrangement. This contributes to an audio interface arrangement, which is flexible and convenient to utilize for various purposes.

55 **[0011]** Preferably, but not necessarily, the accessory determining means may be adapted to obtain an electrical impedance value indicative of which type of audio accessory that is connected to the respective audio connecting means. Furthermore, the accessory determining means may be adapted to determine which type of audio accessory that is connected to the respective audio connecting means on the basis of the obtained electrical impedance value.

60 **[0012]** Advantageously, at least one of the at least two audio connecting means is a socket which is adapted to connect the respective audio accessory by receiving an audio plug of the respective audio accessory.

65 **[0013]** Preferably, but not necessarily, the socket may be a 3.5 mm (millimeter) socket

70 **[0014]** Furthermore, a socket may e.g. comprise three or four contact elements.

[0015] For example, the audio interface arrangement may be adapted to connect the respective audio accessory as an input audio accessory, such as a microphone or a music instrument, or an output audio accessory, such as headphones or a loudspeaker. Alternatively, the audio interface arrangement may be adapted to connect the respective audio accessory as a combined input and output audio accessory, such as a headset.

[0016] In one embodiment, the accessory determining means may be adapted to obtain the impedance value by impedance measurements between two different contact elements of the three or four contact elements. The impedance value between said two different contact elements may be determined at predefined time intervals, such as every 200 milliseconds.

[0017] In one embodiment, the audio interface arrangement may comprise an accessory detecting means coupled to said at least two audio connecting means and to the audio accessory determining means. The accessory detecting means may be adapted to detect that an audio accessory is connected to at least one of the audio connecting means. Furthermore, the accessory determining means may be adapted to determine which type of connected audio accessory of one or more audio accessories that is detected by the accessory detecting means. The audio interface arrangement may additionally comprise an accessory control detecting means coupled to the at least two audio connecting means, the accessory control detecting means being adapted to detect that a control means of any one of the connected audio accessories is activated.

[0018] According to a second aspect, a handheld device is provided. The handheld device may e.g. be a tablet computer, a mobile phone, a smart phone, or a personal digital assistant, to name a few examples. The handheld device comprises an audio interface means according to the first aspect described hereinabove.

[0019] Hereby it is made possible to provide a handheld device, such as a smart phone, that offers a possibility to connect several different audio accessories to the handheld device at the same time. The provision of at least two audio connecting means may enable a user to connect at least two audio accessories to the handheld device. The provision of the accessory determining means further allows for a determination as to which type of audio accessory/-ies that is/are currently connected to the handheld device. This contributes to a handheld device, which is flexible and convenient to utilize for various purposes. For example, the handheld device may meet some of the demands that users demand from their handheld devices.

[0020] In some embodiments, the handheld device may further comprise a processing unit adapted to obtain information from the accessory determining means regarding which audio accessory/-ies that is/are connected to the respective audio connecting means. Furthermore, the processing unit may be further adapted to select at least one audio input source and at least one audio output destination based on which audio accessory/-ies that is/are connected to the respective audio connecting means.

[0021] In one embodiment, the processing unit may be adapted to obtain the information regarding which audio accessory/-ies that is/are connected to the respective audio connecting means as one of: the impedance value obtained by the accessory determining means; and a digital value representing the type of connected audio accessory.

[0022] The information regarding which audio accessory/-ies that is/are connected may be a digital value representing one of: no audio accessory; guitar; headphone; headset; external loudspeaker; and guitar pedal.

[0023] In one embodiment, the processing unit may be adapted to select the at least one audio input source by utilizing an audio routing table. Also, the at least one audio input source may be any one of or any combination of the input sources of the group comprising: internal microphones of the handheld device; a first one of the at least two audio connecting means; and a second one of the at least two audio connecting means.

[0024] In one embodiment, the processing unit may be adapted to select the at least one audio output destination by utilizing an audio routing table. Also, the at least one audio output destination may be any one or any combination of output destinations of the group comprising: internal loudspeakers of the handheld device; a first one of the at least two audio connecting means; and a second one of the at least two audio connecting means.

[0025] The various embodiments of this disclosure recognize that users demand that more and more services, and/or applications, should be offered by handheld devices. The demanded services, and/or applications, may be of varying complexity.

[0026] The various embodiments described herein enables a user to connect several (i.e., at least two) audio accessories to his/her handheld device. As a mere example, a user of a handheld device may connect an electric guitar and headphones to the handheld device at the same time. A user may thus play the guitar and, simultaneously, listen to the thus played guitar music through the headphones. This way, a user of the handheld device may enjoy a new service of his/her handheld device, namely that of the handheld device being (or, forming) a music device for playing and listening to music.

Brief Description of the Drawings

[0027] These and other aspects, features and advantages will be apparent and elucidated from the following description of various embodiments, reference being made to the accompanying drawings, in which:

Fig. 1 shows a mobile phone according to the existing art;

Fig. 2 is a schematic block diagram of an audio interface arrangement in accordance with an example embodiment; and

Fig. 3 shows an example embodiment of a handheld device which comprises the audio interface arrangement shown in Fig 2.

Detailed Description of Embodiments

[0028] The present invention will now be described more fully hereinafter. The invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided by way of example so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those persons skilled in the art. Like reference numbers refer to like elements throughout the description.

[0029] With reference to Figure 2, an audio interface arrangement 200 will now be described in accordance with an exemplifying embodiment. In the illustrated embodiment, the audio interface arrangement 200 is comprised in a handheld device, which is exemplified as a mobile phone 240.

[0030] The audio interface arrangement 200 illustrated in Figure 2 comprises two audio connecting means 202. The audio interface arrangement 200 is adapted to be arranged in a handheld device 240. Each one of the audio connecting means 202 may be adapted to connect a respective audio accessory 250 to the handheld device 240. It should be appreciated that the audio interface arrangement 200 is not limited to the provision of two audio connecting means 202. As will be appreciated, any suitable number of audio connecting means 202 may be conceivable. In other words, the audio interface arrangement 200 may e.g. comprise three or four audio connecting means 202, etc.

[0031] In Figure 2, a headset and an electric guitar are illustrated as two examples of audio accessories 250. However, any other suitable audio accessory 250 may be utilized when appropriate, such as e.g. headphones, a microphone, a loudspeaker, etc.

[0032] The audio interface arrangement 200 also comprises an accessory determining means 204, which is connected to both of the audio connecting means 202. The audio determining means 204 is adapted to determine which type of audio accessory 250 that is connected to the respective audio connecting means 202. For instance, audio accessories such as headsets, headphones, external microphones, external loudspeakers, electric guitars, guitar pedals, etc. may be connected to the audio connecting means 202. In other words, audio input accessories, audio output accessories, as well as combined audio input/output accessories may be connected to the audio connecting means 202. Some examples of audio input accessories are: microphones, electric guitars, guitar pedals, etc. Typical audio output accessories may be external loudspeakers, headphones, etc. A combined audio input/output accessory may for instance be realized as a headset.

[0033] In some advantageous embodiments, the accessory determining means 204 is adapted to obtain an electrical impedance value, which is indicative (or, representative) of the type of audio accessory that is connected to the respective audio connecting means 202.

[0034] For instance, the electrical impedance value of a certain audio connecting means 202 may be obtained as a resistance value measured between two contact elements of that certain audio connecting means 202. Nevertheless, it should be appreciated that the concept is not limited to the utilization of resistance measurements. Alternatively, the electrical impedance value may instead be obtained as a capacitance value, or an inductance value, which may also be indicative of which type of audio accessory that is connected to the audio connecting means 202.

[0035] An example of indicative DC (Direct Current) resistance values of some audio accessory types is shown in the table 1 below.

Table 1. Examples of impedance values for different audio accessories (250).

Accessory type	Accessory DC-resistance (ohm)
Headphones	< 400
Headsets	400 ... 5000
Guitar pedal	> 5000

[0036] In some embodiments, the audio connecting means 202 are implemented as sockets which are adapted to receive corresponding plugs (or, audio plugs) of the audio accessories 250 to be connected.

[0037] A socket 202 may comprises a suitable number of contact elements which are arranged to connect to corresponding contact elements of the audio plug of an audio accessory 250. By arranging an appropriate number of contact

elements, the audio connecting means 202 may be adapted to receive audio plugs and connect to audio accessories of different categories. For instance, when arranging three contact elements, the audio connecting means 202 may connect both input audio accessories and output audio accessories. Alternatively, when arranging four contact elements, the audio connecting means may in addition also connect to combined input/output audio accessories, e.g. headsets.

[0038] A socket may e.g. be implemented as a 3.5 mm audio socket which is arranged to receive a corresponding 3.5 mm (millimeter) audio plug of an appropriate audio accessory 250.

[0039] In some embodiments, the accessory determining means 204 is adapted to perform repeated measurements of the electrical impedance value. This functionality is sometimes referred to as so SW-polling (or, Software-polling). For example, by setting an appropriate time interval between the measurements, e.g. 200 ms (milliseconds), the accessory determining means 204 may notice when an audio accessory 250 is being connected or disconnected almost at the same time as when the connection or disconnection occurs. The accessory determining means 204 may then inform the handheld device 240 that a change of audio accessory 250 has occurred. In this context, a change should be interpreted as also comprising actions of connecting or disconnecting the audio accessory 250.

[0040] In some embodiments, the audio interface arrangement 200 further comprises an accessory detecting means 206. The accessory detecting means 206 may be connected to both of the audio connecting means 202 and is adapted to detect when an audio accessory 250 is connected to any one of the audio connecting means 202, and also to detect when an audio accessory 250 is released from the audio connecting means 202. The accessory detecting means 206 may e.g. be adapted to detect that a DC (Direct Current) -level of an electrical signal of the connecting means 202 is changed. For example, the accessory detecting means 206 may be adapted to detect that a DC -level of an electrical signal of the connecting means 202 is changed by comparing the DC-level with a specific DC-level which is indicative of a connected audio accessory 250. By arranging the accessory detecting means 206 in the audio interface arrangement 200, the accessory determining means 204 may be activated only when the accessory detecting means 206 indicates that a change of audio accessories 250 takes place. Thereby, the above described SW-polling may optionally be omitted from the accessory determining means 204. This may make the design of the accessory determining means 204 less complex. In addition, because the accessory determining means 204 will only be activated when the accessory detecting means 206 detects a change, the power consumption of the accessory determining means 204 may be reduced.

[0041] It is also to be noted that the accessory detecting means 206 may be implemented in different ways. For instance, the accessory detecting means 206 may be implemented as a mechanical switch. If so, the mechanical switch may be arranged, i.e. positioned, within the audio connecting means 202. Insertion of a corresponding audio plug into the audio connecting means 202 may then activate the mechanical switch in such way that it can be detected that the audio accessory 250 is connected. Correspondingly, removal of the audio plug from the audio connecting means 202 will result in that the mechanical switch is deactivated, such that the disconnection (i.e. releasing) of the audio accessory 250 can be detected.

[0042] In addition, the audio interface arrangement 200 may optionally also be equipped with an accessory control detecting means 208. The accessory control detecting means 208 is adapted to detect whether a control means of a connected audio accessory is activated. For instance, the audio interface arrangement means 200 may detect: that a button of a microphone is pressed, that a volume control knob is adjusted, or that a guitar pedal is pressed down, etc. The accessory control detecting means 208 may be connected to both the audio connecting means 202. For each one of the audio connecting means 202, the accessory control detecting means 208 may be adapted to measure an impedance value between two different contact elements of that audio connecting means 202. Table 2 below illustrates examples of typical resistance values of different audio accessory controls.

Table 2. Examples of impedance values for different buttons.

Button type	Button DC-resistance (ohm)	Tolerance %
Headset, send/end button	< 70	-
Guitar pedal, button # 1	150	5 %
Guitar pedal, button # 2	270	5 %

[0043] In the above described exemplifying embodiments, the audio connecting means 202 of the audio interface arrangement 200 are connected to a processing unit 242 of a mobile phone 240.

[0044] The mobile phone 240 may thus be capable of receiving an audio input signal from an audio accessory 250, processing and/or converting the received audio input signal into an audio output signal which is sent to another audio accessory 250.

[0045] With continued reference to Figure 2, a handheld device 240 which comprises the audio interface arrangement 200 of any above described embodiments will now be schematically described in accordance with an exemplifying

embodiment. The handheld device of this embodiment is implemented as a mobile phone 240.

[0046] The mobile phone 240 comprises the audio interface arrangement 200 described hereinabove and a processing unit 242. The audio interface arrangement 200 has been described above and will therefore not be further discussed herein.

[0047] In addition, the mobile phone 240 typically comprises further components or units which are arranged to provide ordinary functionality to the mobile phone 240. To this end, the mobile phone 240 may comprise components such as a display (e.g. a touch-sensitive display), an internal microphone, an internal loudspeaker, various user controls, processors, and storage units (e.g. memory), etc. In Figure 2, only some of these components have been schematically illustrated (e.g. a users control in the form of a scroll wheel 244 and a storage unit 246).

[0048] The accessory determining means 204 is connected to the processing unit 242. The processing unit 242 may be adapted to obtain information from the accessory determining means 204 regarding which type of audio accessory 250 that is connected to the respective audio connecting means 202. Also, the processing unit 242 may additionally be connected to any one or both of the accessory detecting means 206 and the accessory control detecting means 208. In addition, the processing unit 242 may be adapted to obtain information regarding whether any control means of the connected audio accessories are activated.

[0049] The processing unit 242 may be adapted to control the audio connecting means 202 according to an audio routing table. An example of such an audio routing table is shown in Table 3 below.

[0050] In the audio routing table of Table 3, AC1 represents a first one of the audio connecting means 202 and AC2 a second one of the audio connecting means 202. As stated above, the processing unit 242 is adapted to select an audio input source and/or an audio output destination based on which type of audio accessories 250 that are connected to the respective audio connecting means 202.

Table 3. Example of audio routing table.

AC1	AC2	Audio input source	Audio output destination
Empty	Empty	Internal microphones	Internal speakers
Empty	Guitar	AC2 (mono)	Internal speakers
Empty	Headphone	Internal microphones	AC2
Empty	Headset	AC2 (mono)	AC2
Guitar	Empty	AC1 (mono)	Internal speakers
Guitar	Guitar	AC1 + AC2	Internal speakers
Guitar	Headphone	AC1	AC2
Guitar	Headset	AC1 + AC2	AC2
Headphone	Empty	Internal microphones	AC1
Headphone	Guitar	AC2 (mono)	AC1
Headphone	Headphone	Internal microphones	AC1 and AC2
Headphone	Headset	AC2 (mono)	AC1 and AC2
Headset	Empty	AC1 (mono)	AC1
Headset	Guitar	AC1 + AC2	AC1
Headset	Headphone	AC1 (mono)	AC1 and AC2
Headset	Headset	AC1 + AC2 (Cellular call only AC1)	AC1 and AC2

[0051] For instance, as seen in the first row, when no audio accessories 250 are connected to any of the audio connecting means AC1, AC2 (202), the processing unit 242 may select internal microphones and internal speakers (also known as loudspeakers) in accordance with the audio routing table.

[0052] As seen in the eighth row, when an electric guitar is connected to the first audio connecting means AC1 (202) and a headset is connected to the second audio connecting means AC2 (202), the processing unit 242 may be adapted to select both the guitar and the microphone of the headset as audio input source, and the loudspeaker of the headset as audio output destination. A user who is playing the guitar and is wearing the headset can then input audio signals from the guitar as well as audio signals from the microphone of the headset into the mobile phone. The user may also listen to outputted audio signals from the mobile phone through the loudspeakers of the headset. When the user, instead,

wants to mute the microphone of the headset, he/she may press a mute button on the headset. The above described accessory control detecting means 208 may detect that the mute button is activated and the control unit 242 may be operable to mute the microphone of the headset accordingly.

[0053] It is to be noted that even if this exemplifying embodiment describes a mobile phone 240, the herein described concept is not limited to mobile phones. The audio interface arrangement 200 may be arranged in other types of handheld devices when appropriate, such as in PDAs, tablet computers, etc.

[0054] With reference to Figure 3, an example embodiment of a mobile phone 240 will be briefly described. The mobile phone 240 corresponds to the mobile phone 240 of the embodiment described in conjunction with figure 2. Like reference numbers therefore refer to like elements throughout the following description with reference to Fig. 3.

[0055] In this embodiment, the mobile phone 240 comprises two audio connecting means 202, two user control means 244, and a display 212. The two audio connecting means 202 are arranged at an audio interface arrangement (not shown) which is adapted to detect which type of audio accessory (not shown) that is connected to the respective audio connecting means 202. The audio interface arrangement has been described above and will therefore not be described further.

[0056] The mobile phone 240 is adapted to select one of the audio connecting means 202 as audio input source and the other audio connecting means 202 as audio output destination according to an audio routing table. Also, the audio routing table has been described hereinabove and will therefore not be described in further detail.

[0057] In this embodiment, the audio connecting means 202 are implemented as 3.5 mm audio sockets, having four contact elements each. Thereby the mobile phone 240 may utilize both the audio connecting means 202 as any of: audio input means, audio output means, and combined audio input/output means.

[0058] Again, it is worth emphasizing that the disclosed concept is not limited to utilizing 3.5 mm audio sockets as audio connecting means. The mobile phone 240 may be designed with other types of audio sockets (or audio plugs) with three or four contact elements as appropriate, e.g. 6.3 mm audio sockets with three contact elements. As will be appreciated by those skilled in the art, it would be possible to arrange any suitable combination of appropriate audio connecting means, e.g. one 3.5 mm socket and one so called Lightning socket or, alternatively, one USB (Universal Serial Bus) socket. For instance, appropriate types of audio connecting means may be selected from a list of: 3.5 mm (1/8 Inch), 2.5 mm, 6.3 mm (1/4 Inch), Lightning, Micro-USB, Mini-USB, D-shaped 3.5 mm, etc.

[0059] The various embodiments that have been described hereinabove recognize that users demand that more and more services, and/or applications, should be offered by handheld devices, such as mobile phones 240. The various embodiments described herein enables a user to connect several (i.e., at least two) audio accessories 250 to his/her mobile phone 240. As a mere example, a user of the mobile phone 240 described in connection with Figures 2 and 3 may connect an electric guitar 250 as well as headphones 250 to the mobile phone 240 at the same time. A user may thus play the guitar 250 and, simultaneously, listen to the thus played guitar music through the headphones 250. This way, a user of the mobile phone 240 may enjoy a new service of his/her mobile phone 240, namely that of the mobile phone 240 being a music device for playing and listening to music played by means of the electric guitar 250.

[0060] Modifications and other variants of the described embodiments will come to mind to one skilled in the art having benefit of the teachings presented in the foregoing description and associated drawings. Therefore, it is to be understood that the embodiments are not limited to the specific example embodiments described in this disclosure and that modifications and other variants are intended to be included within the scope of this disclosure. Furthermore, although specific terms may be employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation. Therefore, a person skilled in the art would recognize numerous variations to the described embodiments that would still fall within the scope of the appended claims. As used herein, the terms "comprise/comprises" or "include/includes" do not exclude the presence of other elements or steps. Furthermore, although individual features may be included in different claims (or embodiments), these may possibly advantageously be combined, and the inclusion of different claims (or embodiments) does not imply that a combination of features is not feasible and/or advantageous. In addition, singular references do not exclude a plurality. Finally, reference signs in the claims are provided merely as a clarifying example and should not be construed as limiting the scope of the claims in any way.

Claims

1. An audio interface arrangement (200) for a handheld device (240), **characterized in that** the audio interface arrangement (200) comprises:

at least two audio connecting means (202), wherein each of the at least two audio connecting means (202) is adapted to connect a respective audio accessory (250) to the audio interface arrangement (200), at the same time, and

an accessory determining means (204) coupled to said at least two audio connecting means (202), wherein the

accessory determining means (204) is adapted to determine which type of audio accessory (250) that is connected to the respective audio connecting means (202).

2. The audio interface arrangement (200) according to claim 1, wherein the accessory determining means (204) is adapted to obtain an electrical impedance value indicative of which type of audio accessory that is connected to the respective audio connecting means (202), and wherein the accessory determining means (204) is adapted to determine which type of audio accessory (250) that is connected to the respective audio connecting means (202) on the basis of the obtained electrical impedance value.
3. The audio interface arrangement (200) according to claim 1 or 2, wherein at least one of the at least two audio connecting means (202) is a socket which is adapted to connect the respective audio accessory (250) by receiving an audio plug of the respective audio accessory (250).
4. The audio interface arrangement (200) according to claim 3, wherein the socket comprises three contact elements, and the audio interface arrangement (200) is adapted to connect the respective audio accessory (250), as an input audio accessory, such as a microphone or a music instrument, or an output audio accessory, such as headphones or a loudspeaker.
5. The audio interface arrangement (200) according to claim 3, wherein the socket comprises four contact elements, and the audio interface arrangement (200) is adapted to connect the respective audio accessory (250) as a combined input and output audio accessory, such as a headset.
6. The audio interface arrangement (200) according to any one of the claims 3-5, wherein the socket is a 3.5 millimeter socket.
7. The audio interface arrangement (200) according to any one of claims 4-6 when dependent on claim 2, wherein the accessory determining means (204) is further adapted to obtain the impedance value by impedance measurements between two different contact elements of the three or four contact elements.
8. The audio interface arrangement (200) according to claim 7, wherein the accessory determining means (204) is adapted to obtain the impedance value between said two different contact elements at predefined time intervals, such as every 200 milliseconds.
9. The audio interface arrangement (200) according to any one of the claims 1-8, further comprising:

an accessory detecting means (206) coupled to said at least two audio connecting means (202) and to the audio accessory determining means (204), the accessory detecting means (206) being adapted to detect that an audio accessory (250) is connected to at least one of the audio connecting means (202), and wherein the accessory determining means (204) is adapted to determine which type of connected audio accessory (250) that is detected by the accessory detecting means (206).
10. The audio interface arrangement (200) according to any one of the previous claims, further comprising an accessory control detecting means (208) coupled to the at least two audio connecting means (202), the accessory control detecting means (208) being adapted to detect that a control means of any one of the connected audio accessories (250) is activated.
11. A handheld device (240), **characterized in that** it comprises the audio interface arrangement (200) according to any one of the claims 1-10.
12. The handheld device (240) according to claim 11, wherein the handheld device (240) further comprises a processing unit (242) adapted to obtain information from the accessory determining means (204) regarding which audio accessory/-ies (250) that is/are connected to the respective audio connecting means (202), the processing unit (242) further being adapted to select at least one audio input source and at least one audio output destination based on which audio accessories (250) that is/are connected to the respective audio connecting means (202).
13. The handheld device (240) according to claim 12, wherein the processing unit (242) is adapted to obtain the information regarding which audio accessories (250) that is/are connected to the respective audio connecting means

as one of: the impedance value obtained by the accessory determining means (204); and a digital value representing the type of connected audio accessory (250).

5 14. The handheld device (240) according to claim 12 or 13, wherein the information regarding which audio accessories (250) that is/are connected is a digital value representing one of: no audio accessory; a guitar; a headphone; a headset; an external loudspeaker; and a guitar pedal.

10 15. The handheld device (240) according to claim 12 or 13, wherein the processing unit (242) is adapted to select the at least one audio input source by utilizing an audio routing table and the at least one audio input source is/are any one of or any combination of the input sources of the group comprising: internal microphones of the handheld device (240); a first one of the at least two audio connecting means (202); and a second one of the at least two audio connecting means (202).

15 16. The handheld device (240) according to claim 12 or 13, wherein the processing unit (242) is adapted to select the at least one audio output destination by utilizing an audio routing table and the at least one audio output destination is/are any one or any combination of output destinations of the group comprising: internal loudspeakers of the handheld device (240); a first one of the at least two audio connecting means (202); and a second one of the at least two audio connecting means (202).

20 17. The handheld device (240) according to any one of the claims 11-16, wherein the handheld device (240) is any one of the devices of the group comprising: a tablet computer, a mobile phone, a smart phone, and a personal digital assistant.

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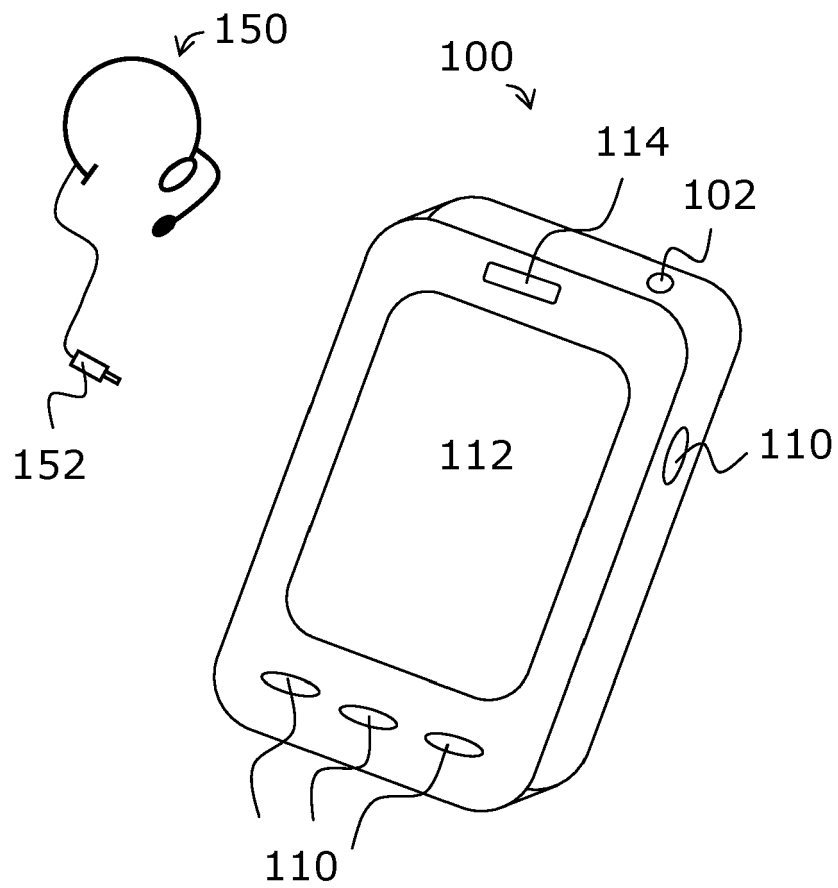


Fig. 1 (existing art)

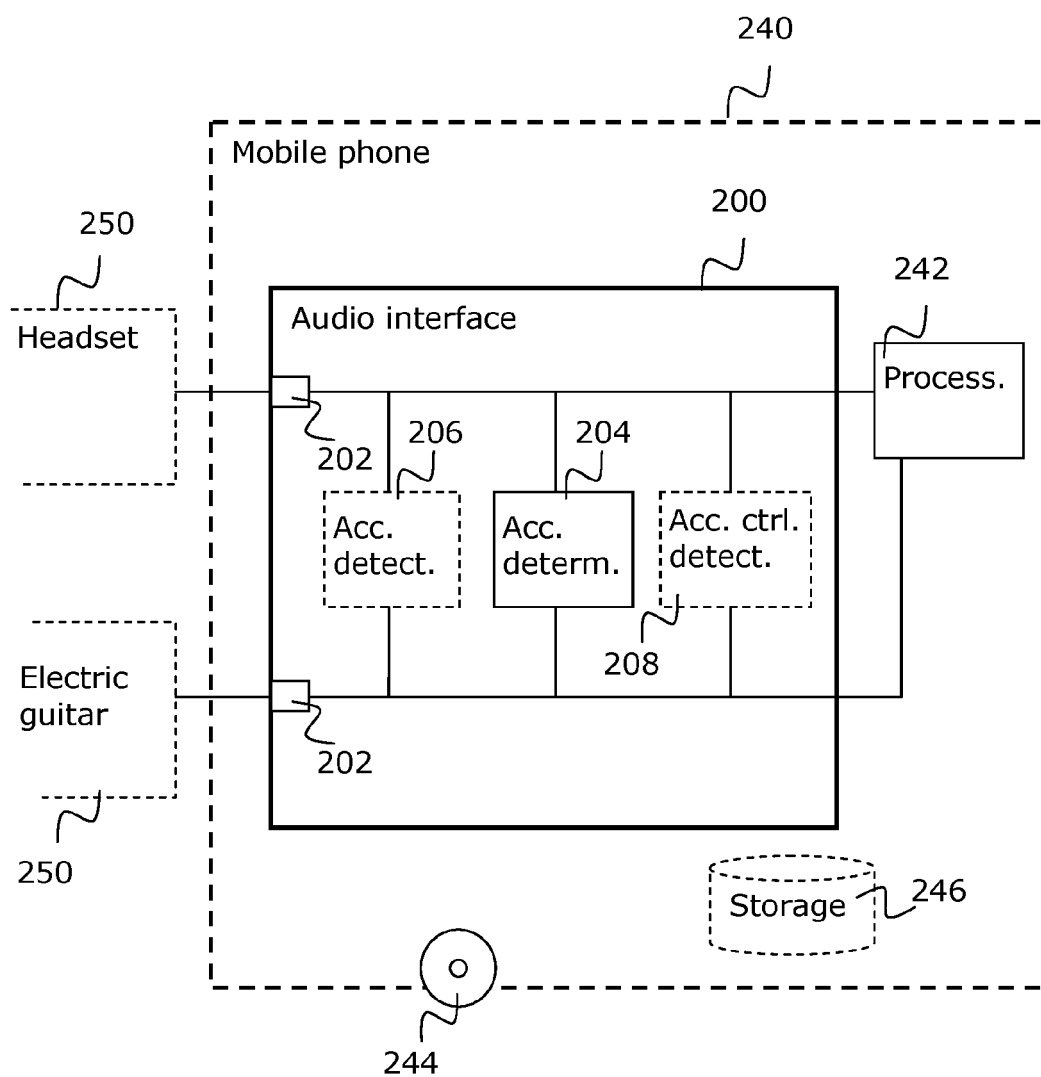


Fig. 2

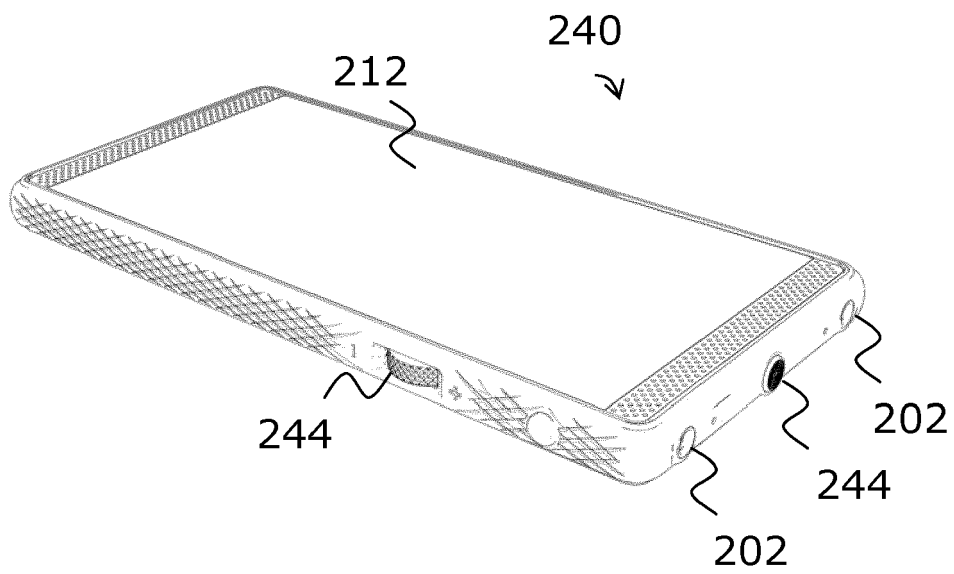


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 15 19 2004

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